IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

App. No.	:	10/506,492	Confirmation No. 1386
Applicant	:	Toshihiko Ushiro	
Filed	:	September 3, 2004	
T.C./A.U.	:	2874	
Examiner	:	Rhonda S. Peace	
Docket No.	:	39.049	
Customer No.	:	29453	

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REPLY Under 37 C.F.R. § 1.111
Accompanying Request for Continued Examination
Under 37 C.F.R. § 1.114

Sir:

In response to the Office action, made final and mailed on February 1, 2006 in the above-identified patent application, Applicants have elected to file a Request for Continued Examination (RCE).

As a submission required by 37 C.F.R. § 1.114(a) and defined in § 1.114(c), the following amendment accompanies the present RCE. (The RCE and this amendment are being filed on May 1, 2006 and is therefore timely filed.)

AMENDMENT Pursuant to 37 C.F.R. § 1.121

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 7 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the present application.

Listing of Claims:

Claim 1 (currently amended): An optical fiber comprising:

an optically diffractive film formed on an end portion of the optical fiber;

a transparent ~~DLC layer~~ DLC material included in said diffractive film, said transparent ~~DLC layer~~ DLC material being formed either onto the face of the optical fiber end portion, or onto an endface of a collimator joined to the endface of the optical fiber; and

a diffraction grating included in said ~~DLC layer~~ DLC material, said diffraction grating containing local regions of relatively high refractive index and local regions of relatively low refractive index.

Claim 2 (previously presented): An optical fiber as set forth in claim 1, wherein said diffractive film allows a single optical beam including a plurality of wavelengths to be split into a plurality of beams depending on the wavelength, and functions as a wavelength-division multiplexer/demultiplexer for causing a plurality of beams having different wavelengths to combine into a unitary optical beam.

Claim 3 (previously presented): An optical fiber as set forth in claim 1, wherein said diffractive film allows a single-wavelength optical beam to be split into a plurality of beams, and functions as a power splitter/combiner for causing a plurality of single-wavelength beams to combine into a unitary optical beam.

Claim 4 (previously presented): An optical fiber as set forth in claim 1, wherein said diffractive film has polarization-division multiplexer/demultiplexer functionality for separating, and causing to unite, TE waves and TM waves contained in a single-wavelength optical beam.

Claim 5 (previously presented): An optical fiber as set forth in claim 1, wherein said diffractive film has wave-plate functionality with respect to either TE waves or TM waves contained in a single-wavelength optical beam.

Claim 6 (previously presented): An optical fiber comprising:

an optically diffractive film formed on an end portion of the optical fiber;

a first transparent DLC layer and a second transparent DLC layer included in said diffractive film and laminated in turn onto an face of the optical fiber end portion, or onto an endface of a collimator joined to the endface of the optical fiber;

a first diffraction grating included in said first DLC layer, said first diffraction grating containing local regions of relatively high refractive index and local regions of relatively low refractive index;

a second diffraction grating included in said second DLC layer, said second diffraction grating containing local regions of relatively high refractive index and local regions of relatively low refractive index; wherein

said first DLC layer has polarization-division demultiplexing functionality for splitting by polarization TE waves and TM waves contained in a single-wavelength optical beam,

said second DLC layer has wave-plate functionality with respect to either TE waves or TM waves contained in a single-wavelength optical beam, and

said first and second DLC layers function interactively as an optical isolator.

Claim 7 (previously presented): An optical fiber as set forth in claim 6, wherein said diffractive film is formed onto the endface of the optical fiber, and has a thickness of 20 μm or less.

Claim 8 (previously presented): An optical fiber as set forth in claim 7, further comprising a connector for retaining the optical fiber end portion where the diffractive film is formed and for abutting the fiber end portion against and connecting it to an endface of another optical fiber.

Claim 9 (previously presented): An optical fiber as set forth in claim 6, further comprising a transparent interlayer inserted in between said first DLC layer and said second DLC layer.

Claim 10 (previously presented): An optical fiber as set forth in claim 1 or 6, wherein said diffractive film includes the diffraction grating being functional with respect to light containing wavelengths within a range of from 0.8 μm to 2.0 μm.

Claim 11 (previously presented): A method of manufacturing an optical fiber as set forth in claim 1 or 6, the optical-fiber manufacturing method comprising a step of forming the high refractive-index regions contained in the diffraction grating(s) by

irradiating said DLC layer(s) in a predetermined pattern with an energy beam to raise the refractive index of the layer(s).

Claim 12 (previously presented): A method of manufacturing the optical fiber set forth in claim 9, the optical-fiber manufacturing method comprising steps of:

depositing said first DLC layer onto the endface of the optical fiber, or onto the endface of the collimator joined to the endface of the optical fiber;

forming said high-refractive index regions in the first DLC layer by irradiating it with an energy beam to raise its refractive index in a first predetermined pattern;

depositing said transparent interlayer and said second DLC layer in turn; and

forming said high-refractive index regions in said second DLC layer by irradiating it with an energy beam to raise its refractive index in a second predetermined pattern; wherein

when said second DLC layer is being irradiated in said second predetermined pattern with an energy beam, said transparent interlayer acts to prevent the energy beam from having an effect on said first DLC layer.

Claim 13 (previously presented): An optical-fiber manufacturing method as set forth in claim 11, wherein the energy beam is selected from an X-ray beam, an electron beam, or an ion beam.

Claim 14 (previously presented): An optical-fiber manufacturing method as set forth in claim 11, wherein said DLC layer(s) is deposited by a plasma CVD technique.

Claim 15 (previously presented): An optical-fiber manufacturing method as set forth in claim 12, wherein the energy beam is selected from an X-ray beam, an electron beam, or an ion beam.

Claim 16 (previously presented): An optical-fiber manufacturing method as set forth in claim 12, wherein said first and second DLC layers are deposited by a plasma CVD technique.

REMARKS

Summary of Amendments

1. Claims 1 through 14 were originally presented in this application. Claims 1 through 14 were amended and claims 15 and 16 were previously added by preliminary amendment. No claims have been added or canceled in this paper. Claim 1 has been amended, as described in more detail below, to more particularly point out and distinctly claim the subject matter of the instant invention. Claims 6, 7, 8, 9, 10_6 (as dependent on claim 6), 11, 12, 13, 14, 15, and 16 were allowed in a first office action on the merits. Claims 1 through 16 remain pending.

2. Applicant wishes to thank the Examiner for the telephonic interview conducted March 6, 2006. An interview summary pursuant to Pursuant to 37 C.F.R. § 1.133(b) and as detailed in MPEP 713.04 is below.

Interview Summary Pursuant to 37 C.F.R. § 1.133(b)

Because reconsideration is being requested in view of the telephone interview conducted on March 6, 2006 between Ms. Rhonda Peace, the Examiner in this case, Ms. Michelle Connelly-Cushwa, Primary Examiner, and Mr. Chris Streinz, appointed as an associate agent by Applicant's undersigned agent of record to represent Applicants in this case, on Applicant's behalf the following summary is submitted, further to the interview summary provided by the Examiner on March 16, 2006. (Mr. Streinz originally initiated the interview.)

A. No exhibit was shown and no demonstration was conducted.
B. Pending claim 1 was discussed.
C. Prior art documents discussed: U.S. Pat. Nos. 4,693,544 (Yamasaki) and 5,138,495 (Shiono).
D. No amendments were originally proposed.
E. The interview was initiated for the purpose of better understanding Examiner's Response to Arguments mailed February 1, 2006. The Examiner explained her interpretation of the Shiono reference and its relation to claim 1. Applicant and Examiner then discussed possible claim amendments.
F. No other matters were discussed.
G. Agreement was reached that amending claim 1 to change "DLC layer" to read "DLC material" would distinguish patentably over Yamasaki in view of Shiono. Examiner indicated that further searching may be required.

Claim Rejections - 35 U.S.C. § 103

Claims 1, 2, 10_1: Yamasaki et al '544 in view of Shiono et al '495

Claim 3: Yamasaki et al '544 in view of Shiono et al '495 and in further view of Iizuka et al '811

Claims 4, 5: Yamasaki et al '544 in view of Shiono et al '495 and in further view of Hida et al '243

3. In the first Office action on the merits, mailed October 17, 2005, independent claim 1 was rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 4,693,544 to *Yamasaki et al.* in view of U.S. Pat. No. 5,138,495 to *Shiono et al.* In their reply, dated January 17, 2006, to that action, Applicants argued that the Examiner failed to make a *prima facie* case of obviousness in that the cited combination of references failed to teach every element of independent claim 1.

4. In the final Action, the Examiner again rejected claims 1 through 5 and 10_1 as being unpatentable over the above-cited combinations of references. Applicants' arguments filed on January 17, 2006 were not considered persuasive by the Examiner.

5. Applicants respectfully traverse this rejection to the extent that it is pertinent to independent claim 1, as amended. Claim 1 has been amended such that the term "DLC layer" has been replaced with the term "DLC material." Applicants submit that this amendment is inherent in previously presented claim 1 such that no new matter has been entered and no new search should be required. The amendment is also supported throughout the specification and figures (e.g., Fig. 14).

6. Applicants respectfully submit that independent claim 1, as amended, now distinguishes patentably over the prior art of record. In particular, there is nothing in either *Yamasaki et al.* or *Shiono et al.* that teaches, discloses, or even suggests: (i) an optical fiber comprising a transparent DLC material included in a diffractive film; and (ii) a diffraction grating included in the DLC material as now recited in independent claim 1. Accordingly, Applicants submit that independent claim 1, as amended, is patentable over *Yamasaki et al* in view of *Shiono et al*.

7. For the foregoing reasons, Applicants respectfully submit that independent claim 1, as amended, is allowable over the cited prior art. Therefore, Applicants request reconsideration and allowance of claim 1. Independent claim 1 being allowable, it follows that dependent claims 2, 3, 4, 5, and 10_1 (as dependent on

claim 1) must also be allowable, since these dependent claims carry with them all of the elements of independent claim 1, to which they ultimately refer.

Accordingly, Applicants courteously urge that this application is in condition for allowance. Favorable action by the Examiner at an early date is solicited.

Respectfully submitted,

May 1, 2006

/James Judge/

James W. Judge
Registration No. 42,701

JUDGE PATENT FIRM
Rivière Shukugawa 3rd Fl.
3-1 Wakamatsu-cho
Nishinomiya-shi, Hyogo 662-0035
JAPAN

Telephone: **305-938-7119**
Voicemail/Fax: **703-997-4565**